

That Which Is Claimed Is:-

1. A method of positioning a component on a substrate, the method comprising:

5 providing a liquid material on the substrate adjacent the component such that the component has a first position relative to the substrate; and
 changing a property of the liquid material while in a liquid state to move the component from the first position relative to the substrate to a second position relative to the substrate while in a liquid state.

10

2. A method according to Claim 1 further comprising:

 before providing the liquid material and changing the property of the liquid material, providing an adhesive material that adheres the component to the substrate wherein the adhesive material is provided in a first state that
15 allows movement of the component relative to the substrate; and
 after providing the liquid material and changing the property of the liquid material, changing the adhesive material to a second state to secure the component in the second position relative to the substrate.

20

3. A method according to Claim 2 wherein changing the adhesive material to the second state comprises changing the adhesive material to the second state while maintaining the liquid material in a liquid state.

4. A method according to Claim 2 further comprising:

25 after changing the adhesive material to the second state, changing a state of the liquid material to a solid while maintaining the component in the second position relative to the substrate.

5. A method according to Claim 2 wherein the adhesive material
30 comprises curable epoxy and wherein changing the adhesive material to the second state comprises curing the curable epoxy.

6. A method according to Claim 2 wherein the adhesive material comprises solder, wherein the first state of the adhesive material is liquid

solder and wherein changing the adhesive material to the second state comprises changing liquid solder to a solid solder.

5 7. A method according to Claim 1 further comprising:
after providing the liquid material and changing the property of the liquid material, securing the component in the second position relative to the substrate.

10 8. A method according to Claim 1 wherein changing the property of the liquid material comprises changing a surface tension of the liquid material.

 9. A method according to Claim 1 wherein changing the property of the liquid material comprises changing an internal pressure of the liquid material.

15 10. A method according to Claim 1 wherein changing the property of the liquid material comprises changing volume of the liquid material.

20 11. A method according to Claim 1 wherein changing the property of the liquid material comprises changing an electrical potential of the liquid material.

25 12. A method according to Claim 1 wherein changing the property of the liquid material comprises heating different portions of the liquid material to different temperatures.

 13. A method according to Claim 1 wherein changing the property of the liquid material comprises changing a pressure exerted by the liquid material against the component.

30 14. A method according to Claim 1 wherein changing the property of the liquid material comprises changing a fluid in contact with the liquid material.

15. A method according to Claim 1 wherein changing the property of the liquid material comprises changing a gas in contact with the liquid material.

16. A method according to Claim 1 wherein the liquid material is constrained on a wettable area of the substrate wherein the wettable area includes a first portion having a first dimension and a second portion having a second dimension, wherein changing the property of the liquid material comprises changing a temperature of the liquid material.

17. A method according to Claim 1 wherein the component comprises an optical fiber, a laser, a lens, and/or a light emitting diode.

18. A method according to Claim 1 wherein the second position is a desired position for the component.

19. A method of positioning a component on a substrate, the method comprising:

providing an initial volume of liquid on a wettable area of the substrate adjacent the component such that the component has a first position relative to the substrate;

changing the volume of the liquid on the wettable area of the substrate adjacent the component to move the component from the first position relative to the substrate to the second position relative to the substrate; and

after providing the initial volume of the liquid and changing the volume of the liquid, securing the component in the second position relative to the substrate.

20. A method according to Claim 19 wherein securing the component comprises cooling the liquid below the melting temperature thereof to solidify the liquid.

21. A method according to Claim 19 wherein changing the volume of the liquid comprises increasing the volume of the liquid on the wettable area.

22. A method according to Claim 19 wherein providing the initial volume of the liquid comprises providing the initial volume of the liquid on the wettable area of the substrate and providing a reservoir of liquid on a second wettable area, and wherein changing the volume of the liquid on the first wettable area comprises moving liquid from the reservoir to the first wettable area.

23. A method according to Claim 19 wherein providing the initial volume of the liquid comprises providing the initial volume of the liquid on the wettable area of the substrate and providing a sump comprising a second wettable area, and wherein changing the volume of the liquid on the first wettable area comprises moving liquid from the first wettable area to the sump.

24. A method according to Claim 19 wherein the component comprises an optical fiber, a laser, a lens, and/or a light emitting diode.

25. A method of positioning a component on a substrate, the method comprising:

providing liquid material on substrate adjacent the component wherein the liquid material is confined to a wettable area of the substrate such that the component is in a first position relative to the substrate; and

differentially heating the liquid material to move the component from the first position to a second position relative to the substrate.

26. A method according to Claim 25 wherein the component comprises an optical fiber, a laser, a lens, and/or a light emitting diode.

27. A method of manipulating a light path between two optical components, the method comprising:

providing a liquid material on a wettable area of a substrate so that the liquid material forms a bump on the wettable area; and

changing a height of the liquid bump between a first height and a second height so that the liquid bump interrupts the light path at the first height of the liquid bump and so that the light path is not interrupted at the second height of the liquid bump.

5

28. A method according to Claim 27 wherein changing a height of the liquid bump comprises differentially heating the liquid bump.

29. A method according to Claim 27 wherein the wettable area of the substrate comprises first and second portions of different dimensions and wherein changing a height of the liquid bump comprises changing temperatures of the liquid on the first and second portions from a first common temperature to a second common temperature.

30. A method according to Claim 27 wherein the wettable area of the substrate comprises first and second portions and wherein changing a height of the liquid bump comprises moving portions of the liquid from the first portion of the wettable area to the second portion of the wettable area.

31. A method according to Claim 30 wherein the first and second portions of the wettable area are coupled by a wettable channel that is narrow with respect to the first and second portions of the wettable area.

32. A method according to Claim 31 wherein moving portions of the liquid comprises differentially heating the first and second portions of the wettable area.

33. A method according to Claim 27 wherein the wettable area of the substrate comprises first and second portions of different dimensions and wherein changing a height of the liquid bump comprises changing an electrical potential of the liquid on the first and second portions from a first common potential to a second common potential.

34. An optical structure comprising:

first and second elongate liquid bumps on a substrate wherein the first and second elongate liquid bumps are parallel; and

an optical fiber in contact with and between the first and second elongate liquid bumps.

5

35. An optical structure according to Claim 34 wherein the first and second elongate liquid bumps are constrained on corresponding first and second wettable areas of the substrate and wherein the first elongate liquid bump is significantly larger than the second elongate liquid bump.

10

36. An optical structure according to Claim 34 wherein the first and second elongate liquid bumps have substantially the same dimensions.

37. An optical structure comprising:

15

an optical component that generates an optical output along an optical path; and

a liquid bump in the optical path wherein the liquid bump is adapted to selectively transmit and interrupt or reflect the optical output.

20

38. An optical structure according to Claim 37 further comprising:

a second optical component in the optical path wherein the second optical component receives the optical output when the optical output is transmitted past the liquid bump and wherein the second optical component does not receive the optical output when the optical output is interrupted or

25

reflected by the liquid bump.

39. A structure comprising:

a substrate;

a first wettable area on the substrate;

30

a second wettable area on the substrate;

a wettable channel on the substrate coupling the first and second wettable areas;

liquid material on the first wettable area; and

a flow control dam on the wettable channel wherein the flow control dam prevents flow of liquid between the first and second wettable areas.

5 40. A structure according to Claim 39 further comprising:
liquid material on the second wettable area.

41. A structure according to Claim 39 wherein the flow control dam comprises a non-wettable material on the wettable channel.

10 42. A structure according to Claim 41 wherein the second wettable area is free of liquid and free of the non-wettable material.

FOOTNOTES